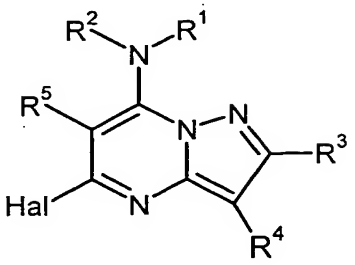
Claims

1. A pyrazolopyrimidine of the formula



(I)

in which

R^1 represents optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkinyl, optionally substituted cycloalkyl or represents optionally substituted heterocyclyl,

R^2 represents hydrogen or alkyl, or

R^1 and R^2 together with the nitrogen atom to which they are attached represent an optionally substituted heterocyclic ring,

R^3 represents hydrogen, halogen, optionally substituted alkyl or optionally substituted cycloalkyl,

R^4 represents halogen, cyano, nitro, alkyl, hydroxyalkyl, alkoxyalkyl, haloalkyl, cycloalkyl, formyl, thiocarbamoyl, alkoxycarbonyl, alkylcarbonyl, benzylcarbonyl, cycloalkylcarbonyl, hydroximinoalkyl, alkoximinoalkyl, alkylthio, alkylsulfinyl, alkylsulfonyl or alkylaminocarbonyl,

Hal represents halogen and

R^5 represents alkyl, haloalkyl, alkenyl, haloalkenyl, cycloalkyl, halogen- or methyl-substituted cycloalkyl, cycloalkenyl or represents halogen- or methyl-substituted cycloalkenyl.

2. The pyrazolopyrimidine of the formula (I) as claimed in claim 1 in which

R^1 represents alkyl having 1 to 6 carbon atoms which may be mono- to pentaisubstituted by identical or different substituents from the group consisting of

halogen, cyano, hydroxy, alkoxy having 1 to 4 carbon atoms and cycloalkyl having 3 to 6 carbon atoms, or

R^1 represents alkenyl having 2 to 6 carbon atoms which may be mono- to trisubstituted by identical or different substituents from the group consisting of halogen, cyano, hydroxy, alkoxy having 1 to 4 carbon atoms and cycloalkyl having 3 to 6 carbon atoms, or

R^1 represents alkinyl having 3 to 6 carbon atoms which may be mono- to trisubstituted by identical or different substituents from the group consisting of halogen, cyano, alkoxy having 1 to 4 carbon atoms and cycloalkyl having 3 to 6 carbon atoms, or

R^1 represents cycloalkyl having 3 to 6 carbon atoms which may be mono- to trisubstituted by identical or different substituents from the group consisting of halogen and/or alkyl having 1 to 4 carbon atoms, or

R^1 represents saturated or unsaturated heterocyclyl having 5 or 6 ring members and 1 to 3 heteroatoms, such as nitrogen, oxygen and/or sulfur, where the heterocyclyl may be mono- or disubstituted by halogen, alkyl having 1 to 4 carbon atoms, cyano, nitro and/or cycloalkyl having 3 to 6 carbon atoms,

R^2 represents hydrogen or alkyl having 1 to 4 carbon atoms, or

R^1 and R^2 together with the nitrogen atom to which they are attached represent a saturated or unsaturated heterocyclic ring having 3 to 6 ring members, where the heterocycle may contain a further nitrogen, oxygen or sulfur atom as ring member and where the heterocycle may be substituted up to 3 times by fluorine, chlorine, bromine, alkyl having 1 to 4 carbon atoms and/or haloalkyl having 1 to 4 carbon atoms and 1 to 9 fluorine and/or chlorine atoms,

R^3 represents hydrogen, fluorine, chlorine, bromine, iodine, alkyl having 1 to 4 carbon atoms, haloalkyl having 1 to 4 carbon atoms and 1 to 4 halogen atoms or represents cycloalkyl having 3 to 6 carbon atoms,

R^4 represents cyano, fluorine, chlorine, bromine, iodine, nitro, formyl, haloalkyl having 1 to 4 carbon atoms and 1 to 9 fluorine, chlorine and/or bromine atoms, alkyl having 1 to 4 carbon atoms, hydroxyalkyl having 1 to 4 carbon atoms, alkoxyalkyl having 1 to 4 carbon atoms in the alkoxy moiety and 1 to 4 carbon

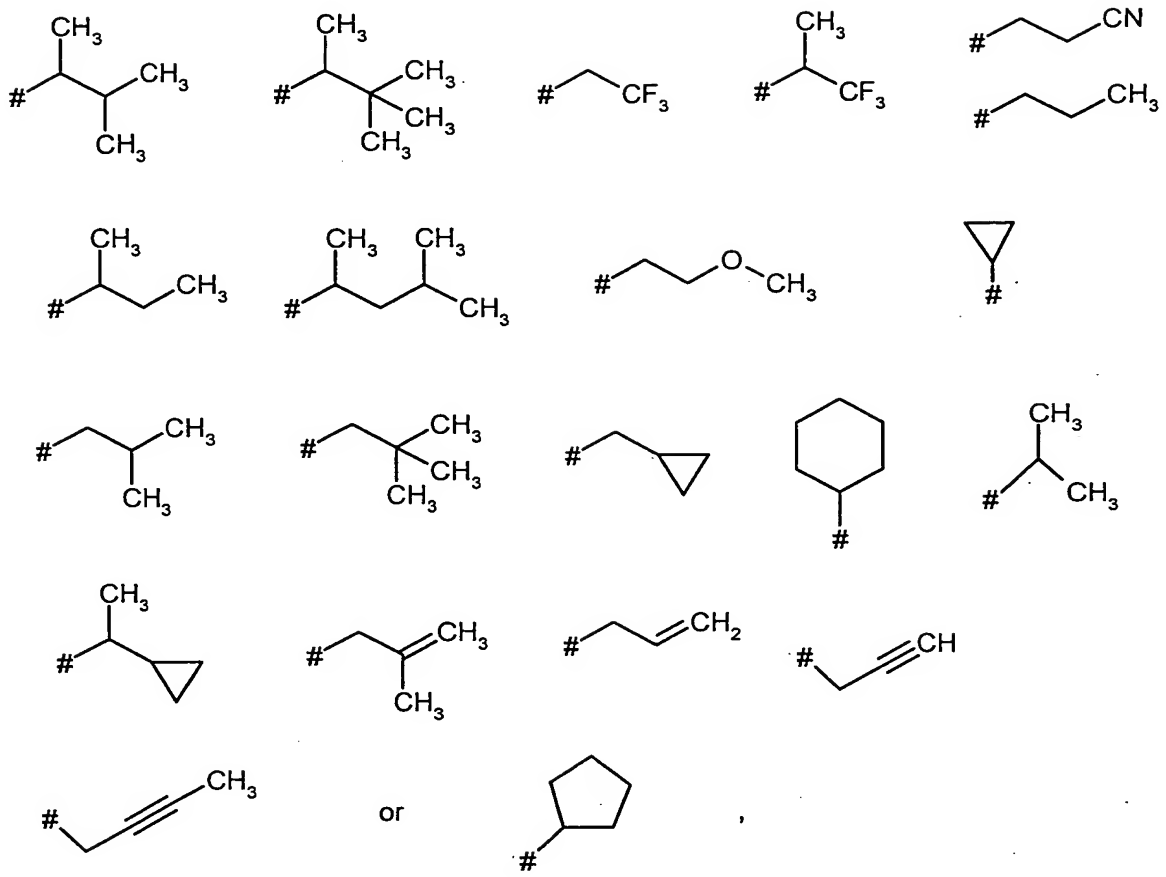
atoms in the alkyl moiety, cycloalkyl having 3 to 6 carbon atoms, thiocarbomoyl, alkoxycarbonyl having 1 to 4 carbon atoms in the alkoxy moiety, alkylcarbonyl having 1 to 4 carbon atoms in the alkyl moiety, benzylcarbonyl, cycloalkylcarbonyl having 3 to 6 carbon atoms in the cycloalkyl moiety, hydroximinoalkyl having 1 to 4 carbon atoms in the alkyl moiety, alkoximinoalkyl having 1 to 4 carbon atoms in the alkoxy moiety and 1 to 4 carbon atoms in the alkyl moiety, alkylthio having 1 to 4 carbon atoms, alkylsulfinyl having 1 to 4 carbon atoms, alkylsulfonyl having 1 to 4 carbon atoms or represents alkyl-aminocarbonyl having 1 to 4 carbon atoms in the alkyl moiety,

Hal represents fluorine, chlorine or bromine and

R^5 represents alkyl having 1 to 6 carbon atoms, alkenyl having 2 to 6 carbon atoms, cycloalkyl having 3 to 8 carbon atoms, cycloalkenyl having 3 to 8 carbon atoms, haloalkyl having 1 to 6 carbon atoms and 1 to 5 fluorine, chlorine and/or bromine atoms, haloalkenyl having 2 to 6 carbon atoms and 1 to 5 fluorine, chlorine and/or bromine atoms, cycloalkyl which has 3 to 8 carbon atoms and is substituted by 1 to 3 fluorine, chlorine and/or bromine atoms or represents cycloalkenyl which has 3 to 8 carbon atoms and is substituted by 1 to 3 fluorine, chlorine and/or bromine atoms.

3. The pyrazolopyrimidine of the formula (I) as claimed in claim 1 or 2 in which

R^1 represents a radical of the formula



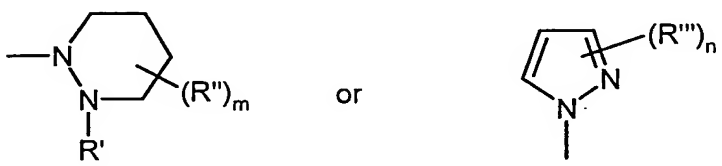
where # denotes the point of attachment,

R^2 represents hydrogen, methyl, ethyl or propyl, or

R^1 and R^2 together with the nitrogen atom to which they are attached represent pyrrolidinyl, piperidinyl, morpholinyl, thiomorpholinyl, piperazinyl, 3,6-dihydro-1(2H)-piperidinyl or tetrahydro-1(2H)-pyridazinyl, where these radicals may be substituted by 1 to 3 fluorine atoms, 1 to 3 methyl groups and/or trifluoromethyl,

or

R^1 and R^2 together with the nitrogen atom to which they are attached represent a radical of the formula



in which

R' represents hydrogen or methyl,

R" represents methyl, ethyl, fluorine, chlorine or trifluoromethyl,

m represents the numbers 0, 1, 2 or 3, where R" represents identical or different radicals, if m represents 2 or 3,

R''' represents methyl, ethyl, fluorine, chlorine or trifluoromethyl

and

n represents the numbers 0, 1, 2 or 3, where R''' represents identical or different radicals if n represents 2 or 3,

R^3 represents hydrogen, fluorine, chlorine, bromine, iodine, methyl, ethyl, isopropyl, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, trifluoromethyl, 1-trifluoromethyl-2,2,2-trifluoroethyl or heptafluoroisopropyl,

R^4 represents cyano, fluorine, chlorine, bromine, iodine, nitro, formyl, trifluoromethyl, difluoromethyl, chloromethyl, methyl, ethyl, cyclopropyl, thiocarbamoyl, methoxycarbonyl, methylcarbonyl, ethylcarbonyl, benzylcarbonyl, cyclopropylcarbonyl, cyclopentylcarbonyl, cyclohexylcarbonyl, hydroximinomethyl, methoximinomethyl, methylthio, methylsulfinyl, methylsulfonyl, methylaminocarbonyl, hydroxymethyl, hydroxyeth-1-yl, methoxymethyl, ethoxymethyl or 1-methoxyethyl,

Hal represents fluorine or chlorine and

R^5 represents alkyl having 1 to 4 carbon atoms, alkenyl having 2 to 4 carbon atoms, cycloalkyl having 3 to 7 carbon atoms or cycloalkenyl having 3 to 7 carbon atoms, or

R^5 represents haloalkyl having 1 to 4 carbon atoms and 1 to 5 fluorine, chlorine and/or bromine atoms, haloalkenyl having 3 or 4 carbon atoms and 1 to 3 fluorine, chlorine and/or bromine atoms, cycloalkyl which has 3 to 6 carbon atoms and substituted by 1 to 3 fluorine, chlorine and/or bromine atoms or represents cycloalkenyl which has 3 to 6 carbon atoms and is substituted by 1 to 3 fluorine, chlorine and/or bromine atoms.

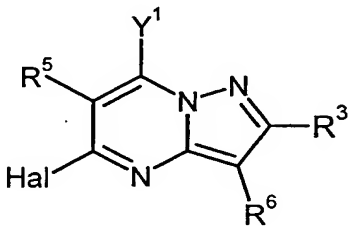
4. The pyrazolopyrimidine of the formula (I) as claimed in one or more of claims 1 to 3, in which

R^3 represents hydrogen, fluorine, chlorine, bromine, methyl, ethyl, propyl, isopropyl, trifluoromethyl or cyclopropyl and

R^5 represents methyl, ethyl, propyl, isopropyl, n-butyl, i-butyl, sec-butyl, tert-butyl, allyl, but-2-en-1-yl, cyclopropyl, cyclopentyl, cyclohexyl, cyclopentenyl, cyclohexenyl, chloromethyl, trifluoromethyl, trifluoroisopropyl, trichloroallyl, 2,2-dichlorocyclopropyl or dichlorocyclohexenyl.

5. A process for preparing pyrazolopyrimidines of the formula (I) as claimed in one or more of claims 1 to 4, characterized in that

(a) halopyrazolopyrimidines of the formula



(II)

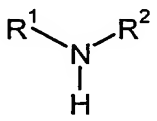
in which

R^3, R^5 and Hal are as defined in claim 1,

R^6 represents halogen, cyano, nitro, alkyl, haloalkyl, cycloalkyl, formyl, thiocarbamoyl, alkoxycarbonyl, alkylthio, alkylsulfinyl, alkylsulfonyl or alkylaminocarbonyl and

Y^1 represents halogen,

are reacted with amines of the formula



(III)

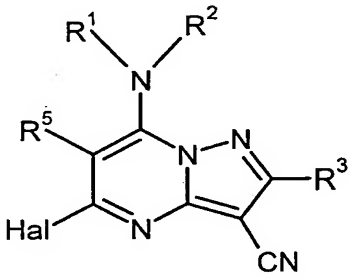
in which

R^1 and R^2 are as defined in claim 1,

if appropriate in the presence of a diluent, if appropriate in the presence of an acidic receptor and if appropriate in the presence of a catalyst,

or

b) pyrazolopyrimidines of the formula



(Ia)

in which

R^1, R^2, R^3, R^5 and Hal are as defined in claim 1

are either

α) reacted with diisobutylaluminum hydride in the presence of aqueous ammonium chloride solution and in the presence of an organic diluent,

or

β) reacted with Grignard compounds of the formula

$$R^7 - Mg - X^2 \qquad (IV)$$

in which

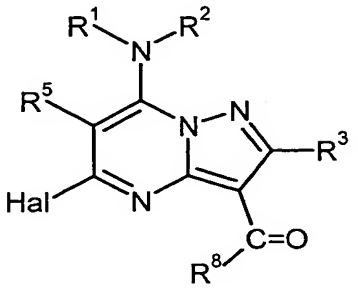
R^7 represents alkyl, benzyl or cycloalkyl and

X^2 represents chlorine, bromine or iodine,

in the presence of a diluent and, if appropriate, in the presence of a catalyst,

or

c) pyrazolopyrimidines of the formula



(Ib)

in which

R^1, R^2, R^3, R^5 and Hal are as defined above and

R^8 represents hydrogen, alkyl, benzyl or cycloalkyl,

are either

α) reacted with amino compounds of the formula

$$H_2N\text{-}OR^9 \qquad (V)$$

in which

R^9 represents hydrogen or alkyl,

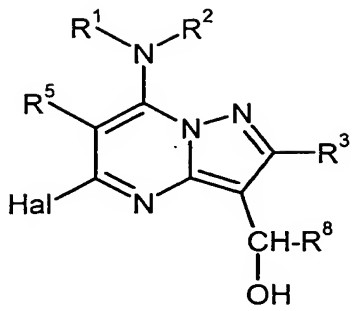
in the presence of a diluent and, if appropriate, in the presence of a catalyst, where the amino compounds of the formula (V) can also be employed in the form of their acid addition salts,

or

β) reacted with diisobutylaluminum hydride in the presence of aqueous ammonium chloride solution and in the presence of an organic diluent,

or reacted with sodium borohydride in the presence of a diluent,

and the resulting pyrazolopyrimidines of the formula



(Ic)

in which

R^1, R^2, R^3, R^5 R^8 and Hal are as defined above

are, if appropriate, reacted with alkylating agents of the formula

$$R^{10} - X^1 \qquad \text{(VI)}$$

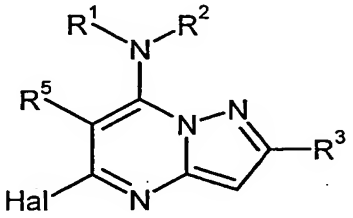
in which

R^{10} represents alkyl and

X^1 represents chlorine, bromine, iodine or the radical $R^8O\text{-}SO_2\text{-}O$-,

if appropriate in the presence of a base and in the presence of a diluent,

d) pyrazolopyrimidines of the formula

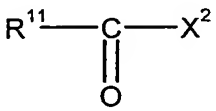


(VII)

in which

R^1, R^2, R^3, R^5 and Hal are as defined above

are reacted with acid halides of the formula



(VIII)

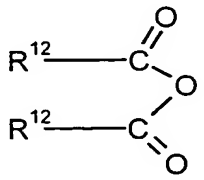
in which

R^{11} represents alkyl, benzyl or cycloalkyl and

X^2 represents chlorine or bromine,

or

with acid anhydrides of the formula



(IX)

in which

R^{12} represents alkyl,

in each case in the presence of a catalyst and in the presence of a diluent.

6. A composition for controlling unwanted microorganisms, characterized in that it comprises at least one pyrazolopyrimidine of the formula (I) according to one or more of claims 1 to 4, in addition to its extenders and/or surfactants.

7. The composition as claimed in claim 6, comprising at least one further fungicidally or insectidally active compound.

8. The use of pyrazolopyrimidines of the formula (I) as claimed in one or more of claims 1 to 4, for controlling unwanted microorganisms.

9. A method for controlling unwanted microorganisms, characterized in that pyrazolopyrimidines of the formula (I) as claimed in one or more of claims 1 to 4 are applied to the unwanted microorganisms and/or their habitat.

10. A process for preparing compositions for controlling unwanted microorganisms, characterized in that pyrazolopyrimidines of the formula (I) as claimed in one or more of claims 1 to 4 are mixed with extenders and/or surfactants.